3000 SI series 4-20mA sensor/transmitter

User manual

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1 Introduction

The Analox 3000 SI range of oxygen/toxic gas sensor/transmitters are constructed as complete integrated units using 'state of the art' electrochemical sensors together with the necessary electronic circuits to convert the tiny electrical signals from the sensor to an industry standard 2 wire, 4-20mA output. The sensor cell mounting is designed in such a way that cell replacement may easily be carried out by the user in a similar way to changing a torch battery.

The 3000 SI range of sensor/transmitters are housed in an intrinsically safe, totally weather proof unit contained in a cylindrical stainless steel housing, rated IP65. All the electronic circuitry is encapsulated in an epoxy resin.

Models are available for the gases and ranges shown in Table 1.

Table 1: Sensor types and ranges

Gas		Model	Ranges
carbon monoxide	CO	3000 SI	0 to 100 ppm 0 to 200 ppm 0 to 300 ppm 0 to 500 ppm 0 to 1000 ppm
hydrogen sulphide	H_2S	3001 SI	0 to 50 ppm 0 to 100 ppm 0 to 500 ppm
sulphur dioxide	SO_2	3002 SI	0 to 20 ppm 0 to 100 ppm
hydrogen	H_2	3003 SI	0 to 1000 ppm 0 to 2000 ppm
nitrogen dioxide	NO_2	3004 SI	0 to 10 ppm 0 to 100 ppm
nitric oxide	NO	3005 SI	0 to 100 ppm 0 to 1000 ppm
chlorine	Cl_2	3006 SI	0 to 10 ppm 0 to 100 ppm
hydrogen cyanide	HCN	3007 SI	0 to 10 ppm 0 to 50 ppm 0 to 100 ppm
ammonia	NH_3	3008 SI	0 to 50 ppm 0 to 100 ppm 0 to 200 ppm
ozone	O_3	3009 SI	0 to 2 ppm 0 to 5 ppm
hydrogen chloride	HCl	3010 SI	0 to 10 ppm
chlorine dioxide	ClO_2	3011 SI	0 to 10 ppm
oxygen	O_2	3012 SI	0 to 25%
fluorine	F_2	3013 SI	0 to 10 ppm
phosphine	PH_3	3014 SI	0 to 10 ppm
bromine	Br_2	3015 SI	0 to 10 ppm
hydrogen fluoride	HF	3016 SI	0 to 10 ppm
ethylene oxide	C_2H_4O	3017 SI	0 to 20 ppm

2 Health warning

Sensor cells used in the 3000 SI series contain an acid electrolyte.

The sensors are shipped with the sensor cell already fitted. Replacement sensor cells are shipped in sealed packs.

If there are any signs of chemical leakage from either the sensor assembly or from the replacement cells, use rubber gloves and wear chemical splash goggles to handle and clean up. Thoroughly rinse contaminated surfaces with water.

Note the first aid procedures in Table 2 to be adopted in the event of contacting the sensor electrolyte if it accidentally leaks.

Table 2 : First aid procedures

Contact type	Effect	First aid procedure
Skin	Acid electrolyte is corrosive. Skin contact could result in a chemical burn.	Wash the affected parts with a lot of water and remove contaminated clothing. If stinging persists get medical attention.
Ingestion	Can be harmful or FATAL if swallowed	Drink a lot of fresh water. Do not induce vomiting. Get medical attention immediately.
Eye	Contact can result in the permanent loss of sight	Get medical help immediately and continue to wash with a lot of water for at least 15 minutes

3 Installation

3.1 Mechanical installation

The 3000 SI range is designed to be wall mounted or free standing. Mounting orientation does not affect the operation of the sensor, although it is important to ensure that liquids such as water, cannot collect in the gas entry port. The sensor may be used to monitor ambient conditions or a gas sample in a small bore pipe when a flow adapter is fitted.

Wall mounting is by means of the right angle bracket supplied with the sensor. This may be removed by unscrewing the knurled acetal locking nut.

It is very important that the sensor cell is NOT pressurised when used for monitoring piped samples - the adapter MUST exhaust to atmospheric pressure.

The sensor has a small sensitivity to rate of flow of gas past the sensing surface. It is therefore important that the flow rate be kept within narrow limits. Recommended minimum and maximum flow rates are 150ml/min and 300ml/min respectively.

Failure to observe these conditions will result in inaccurate readings.

3.2 Basic electrical installation

This section merely describes the basic electrical installation of the sensor. Refer to section 3.2.2 for additional details required for use in hazardous areas.

The sensor/transmitter is supplied with 2 metres of twin screened cable. This may be used to connect to a suitable junction box.

The internal circuit is connected to the two cores and isolated from the metal case.

The cable screen is connected electrically to the sensor housing. This MUST be taken into account on any installation in which the apparatus is used.

Any cable connected to the sensor/transmitter should be of the screened, twisted pair type to ensure maximum protection from any external electrical noise. Ensure that the screen of the cable is connected to a suitable ground at only one end of the cable run to avoid unnecessary earth loops.

Basic electrical connections are shown in Figure 1.

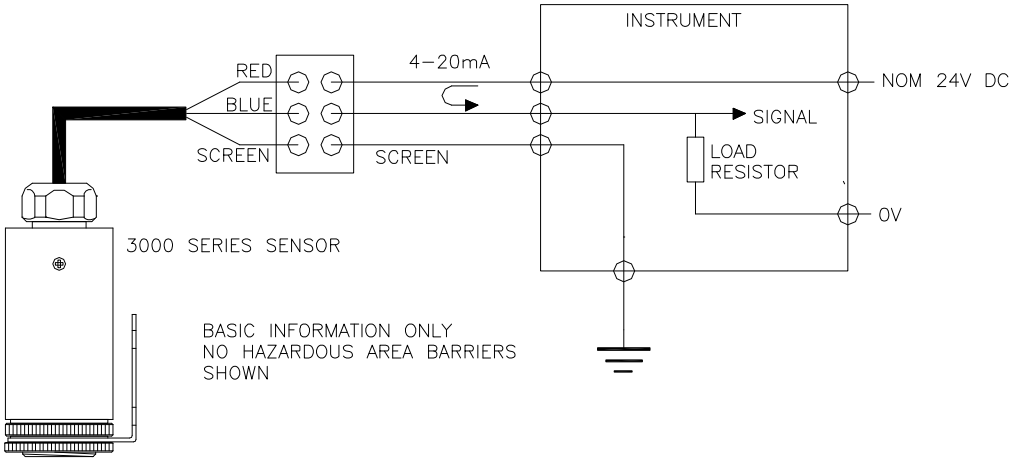

Figure 1 : Basic electrical connections

The unit is designed to operate over a standard 2 wire 4-20mA system using a power supply between 13 and 36 volts DC. Under no circumstances should supplies over 36 volts be connected to the unit. The unit is fitted with a series diode to provide reverse polarity protection.

3.2.1 Power supply and cable length

The output voltage of the power supply which is used to power the 4-20mA loop will determine the maximum permissible loop resistance in the external circuit. Figure 2 shows the relationship between power supply voltage and total loop resistance.

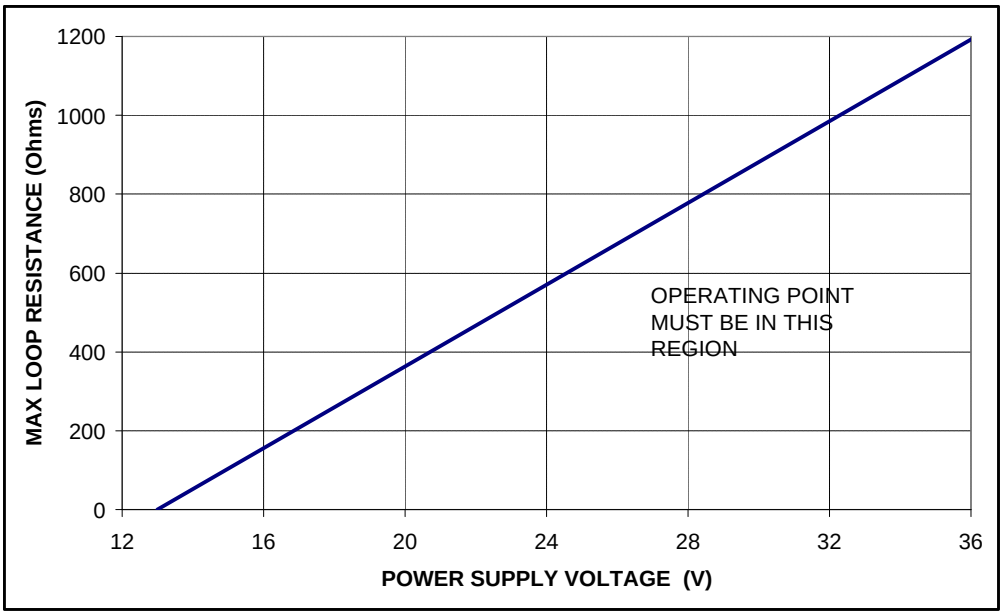

Figure 2 : Maximum loop resistance versus power supply voltage

It can be seen that for a supply of 24 volts DC the maximum permissible loop resistance is 580 Ohms. This will permit the use of typical measuring resistors as follows:

Resistor (Ohms)	Signal (Volts)
500	2.0 to10.0
250	1.0 to 5.0
100	0.4 to 2.0
50	0.2 to 1.0

3.2.2 Hazardous area installation

The 3000 SI sensor series are designed to meet the requirements of the European ATEX Directive 94/9/EC. The product has been certified by Baseefa 2001 (now Baseefa). Relevant information is shown in section 10.2.

When installed in a hazardous area, it is necessary to install a zener barrier in the safe area as shown in Figure 3.

The safety barrier may be obtained from Analox (refer to section 8). The barrier supplied will be one of the barriers shown below or an equivalent with a safety description as specified in section 10.2.

Type	**Approval**
7787 +	Ex95C2261, BAS99ATEX7285
787S	Ex832452, BAS01ATEX7202

Where a system is being built with a number of sensors, Analox can also supply enclosures designed to house multiple barriers. Enclosures are available catering for 5, 13 or 33 barrier positions.

Enclosure dimensions are

Enclosure size	Width (mm)	Height (mm)	Depth (mm)
5 Barriers	125	175	150
13 Barriers	270	360	184
33 Barriers	540	270	184

Baseefa special conditions for safe use

1	Connections are made by means of a two core screened cable. The internal circuit is connected to the two cores and isolated from the metal case, but the screen is connected to the metal case. This must be taken into account on any installation in which the apparatus is used.
2	This apparatus is not designed for use in oxygen enriched atmospheres.

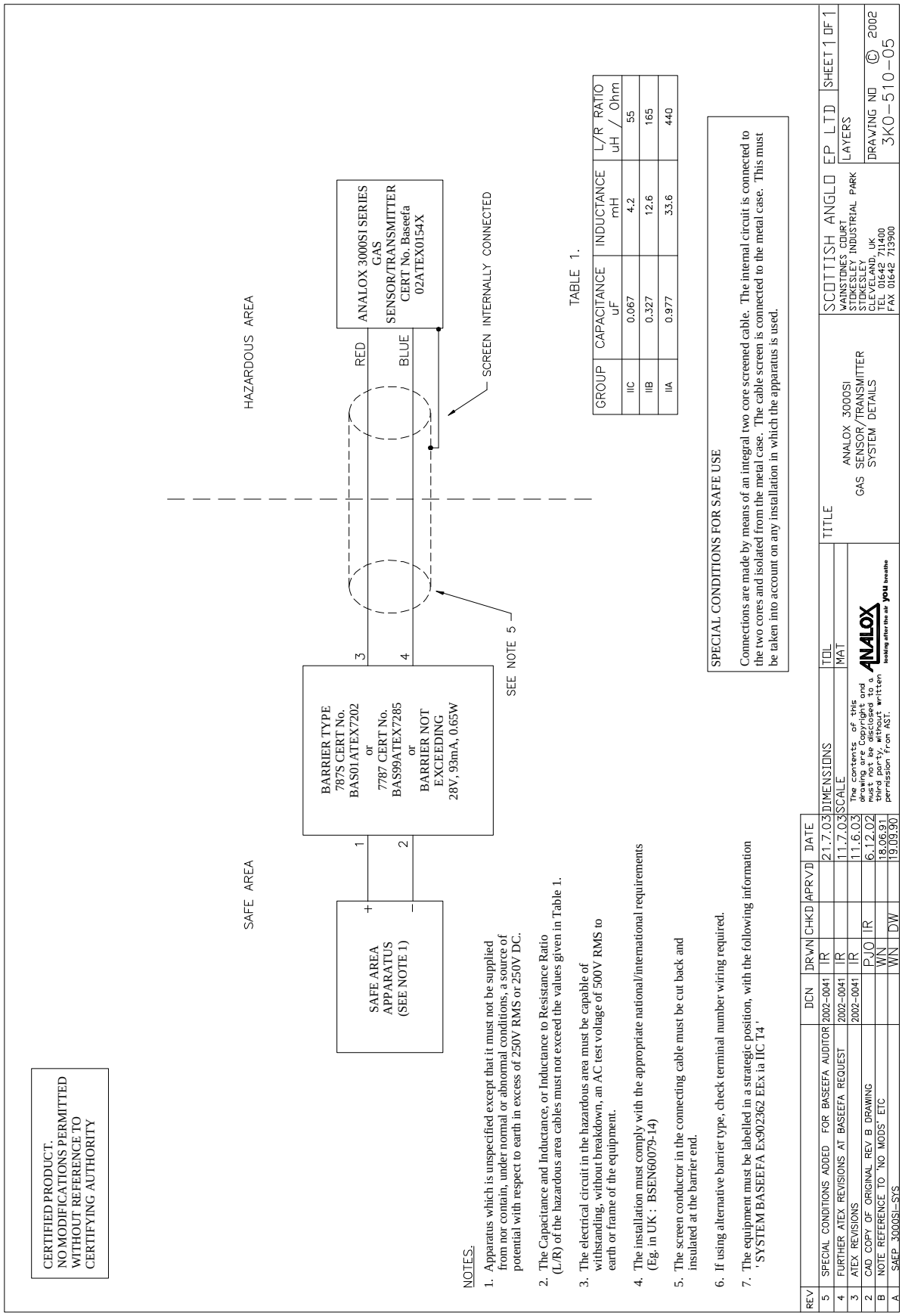
CERTIFIED PRODUCT.
NO MODIFICATIONS PERMITTED
WITHOUT REFERENCE TO
CERTIFYING AUTHORITY
SAFE AREA
HAZARDOUS AREA
SAFE AREA APPARATUS (SEE NOTE 1)
+
–
1
2
BARRIER TYPE 787S CERT No. BAS01ATEX7202 or 7787 CERT No. BAS99ATEX7285 or BARRIER NOT EXCEEDING 28V, 93mA, 0.65W
3
4
RED
BLUE
ANALOX 3000SI SERIES GAS SENSOR/TRANSMITTER CERT No. Baseefa 02ATEX0154X
SCREEN INTERNALLY CONNECTED
SEE NOTE 5
TABLE 1.
GROUP | CAPACITANCE uF | INDUCTANCE mH | L/R RATIO uH / Ohm
IIC | 0.067 | 4.2 | 55
IIB | 0.327 | 12.6 | 165
IIA | 0.977 | 33.6 | 440
NOTES.
1. Apparatus which is unspecified except that it must not be supplied from nor contain, under normal or abnormal conditions, a source of potential with respect to earth in excess of 250V RMS or 250V DC.
2. The Capacitance and Inductance. or Inductance to Resistance Ratio (L/R) of the hazardous area cables must not exceed the values given in Table 1.
3. The electrical circuit in the hazardous area must be capable of withstanding, without breakdown, an AC test voltage of 500V RMS to earth or frame of the equipment.
4. The installation must comply with the appropriate national/international requirements (Eg. in UK : BSEN60079-14)
5. The screen conductor in the connecting cable must be cut back and insulated at the barrier end.
6. If using alternative barrier type, check terminal number wiring required.
7. The equipment must be labelled in a strategic position, with the following information
'SYSTEM BASEEFA Ex902362 EEx ia IIC T4'
SPECIAL CONDITIONS FOR SAFE USE
Connections are made by means of an integral two core screened cable. The internal circuit is connected to the two cores and isolated from the metal case. The cable screen is connected to the metal case. This must be taken into account on any installation in which the apparatus is used.
REV | | DCN | DRWN | CHKD | APRVD | DATE
5 | SPECIAL CONDITIONS ADDED FOR BASEEFA AUDITOR | 2002-0041 | IR | | | 21.7.03
4 | FURTHER ATEX REVISIONS AT BASEEFA REQUEST | 2002-0041 | IR | | | 11.7.03
3 | ATEX REVISIONS | 2002-0041 | IR | | | 11.6.03
2 | CAD COPY OF ORIGINAL REV B DRAWING | | PJO | IR | | 6.12.02
B | NOTE REFERENCE TO 'NO MODS' ETC | | WN | | | 18.06.91
A | SAEP 3000SI-SYS | | WN | DW | | 19.09.90
DIMENSIONS | TOL
SCALE | MAT
The contents of this drawing are Copyright and must not be disclosed to a third party, without written permission from AST.
TITLE
ANALOX 3000SI GAS SENSOR/TRANSMITTER SYSTEM DETAILS
SCOTTISH ANGLO EP LTD
WAINSTONES COURT
STOKESLEY INDUSTRIAL PARK
STOKESLEY
CLEVELAND, UK
TEL 01642 711400
FAX 01642 713900
SHEET 1 OF 1
LAYERS
DRAWING NO 3K0-510-05
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Figure 3 : Hazardous Area Installation

4 Calibration

> ***WARNING***
>
> Calibration of the toxic sensors inevitably involves the handling of toxic gases. Any personnel performing calibration must be aware of the dangers involved. If in doubt, seek advice.

All 3000 SI sensor/transmitters are calibrated before leaving the factory.

Sensors used in safety applications should be checked after installation and fully calibrated at least every 6 months. When safety is of paramount importance, a check that the sensor is working should be carried out in accordance with your established safety procedures.

The sensor drift data in section 11 may be useful to determine calibration intervals. Note that ammonia, ozone and hydrogen fluoride may require more frequent calibration.

> ***Note for users of 3005, 3008, 3010 and 3017 SI:***
>
> The cells used in the 3005 SI, 3008 SI, 3010 SI and 3017 SI sensors (nitric oxide, ammonia, hydrogen chloride and ethylene oxide) operate in a slightly different mode from the others in the range. These four sensors require a longer settling time after the initial application of excitation voltage and it is recommended that a calibration check is carried out about 24 hours after 'power up'. Further very slow movement of the 'zero' level will occur over a period of about 3 weeks after initial power-up. Consequently, checks should be made over this period and a full calibration procedure carried out at the end of this period. It is also important that these sensors should be left switched on to avoid a further settling period.

If the sensor is being used with an Analox monitoring instrument then routine calibration may be carried out using the 'ZERO' and 'CAL' or 'SPAN' controls on the instrument (section 4.2). The same procedure applies to any other instrument which has similar adjustment available. If it is required to check or adjust the sensor/transmitter output current then refer to section 4.3. This will not normally be possible when the sensor is mounted in a hazardous area.

If, during calibration, it is not possible to achieve a satisfactory 'SPAN' adjustment then it is possible that the sensor cell has reached the end of its useful life and should be replaced. Refer to section 5.

4.1 Calibration equipment requirement

The following items will be required to calibrate the sensor.

- Flow adapter (refer to section 7)
- Inert gas (e.g. nitrogen or clean air)
- Certified span gas.

The inert gas is usually nitrogen or clean air. (Note air cannot be used for oxygen sensors).

The span gas is specific to the sensor being calibrated and of a concentration as near as possible to the range in which most measurements are to be made.

4.2 Calibration by monitoring instrument

Step	Details
1	Fit a flow adapter to the cell retaining bush, together with a sample to connect the flow adapter to a calibration gas bottle.
2	Purge the sensor with zero gas. Adjust the flow rate to between 150 and 300ml/min and wait about 5 minutes or until the reading is stable.
3	Adjust the instrument 'ZERO' control until the display reads zero
4	Turn off and disconnect the zero gas
5	Purge the sensor with span gas. Adjust the flow rate to between 150 and 300ml/min and wait about 5 minutes or until the reading is stable.
6	Adjust the 'CAL' or 'SPAN' control on the instrument until the reading agrees with the known concentration of the test gas.
7	Turn off and disconnect the span gas
8	Recheck both Zero and Span Gas readings and ensure that no further adjustments are necessary.
9	Remove the flow adapter.

4.3 Direct calibration of sensor

This procedure will not normally be possible when the sensor is mounted in a hazardous area.

Step	Details
1	Carefully unscrew the cable gland retaining nut on the rear of the sensor body. This will require the use of a spanner, since the gland is tightened sufficiently to ensure sealing and cable retention.
2	Remove the single retaining crosshead screw and slide the stainless steel outer body away from the inner acetal housing. It is not necessary to remove the knurled front adapter during this operation.
3	Locate the 'ZERO' and 'SPAN' potentiometer adjustments near the edge of the inner housing as shown in Figure 4. It is important that great care is exercised to ensure that no strain, in the form of twisting or bending, is placed on the cable, where it joins the internal printed circuit board.
4	Connect a digital volt meter or milli-ammeter in the loop circuit and set to a suitable range for measuring 0 to 20 milliamps.
5	Fit a flow adapter to the cell retaining bush, together with a sample to connect the flow adapter to a calibration gas bottle.
6	Purge the sensor with zero gas. Adjust the flow rate to between 150 and 300ml/min and wait about 5 minutes or until the reading is stable.
7	Adjust the 'ZERO' control until the measured current is 4.0mA.
8	Turn off and disconnect the zero gas
9	Purge the sensor with span gas. Adjust the flow rate to between 150 and 300ml/min and wait about 5 minutes or until the reading is stable.
10	Adjust the 'SPAN' control until the reading agrees with the known concentration of the test gas (refer to example below). Remove the certified test gas and flow adapter.
11	Turn off and disconnect the span gas
12	Now refit the securing screw and cable gland. Ensure that the cable gland is correctly tightened to give a good seal and adequate retention of the sensor cable. In general, it has been found that one full turn from 'finger tight' provides a satisfactory condition.
13	Re-apply zero gas and check the reading is still correct
14	Re-apply span gas and check the reading is still correct
15	Remove the flow adapter.
16	Remove the digital volt meter or milli-ammeter from the loop circuit

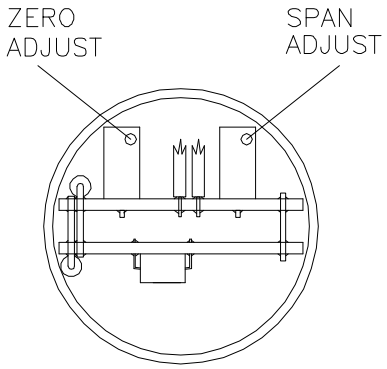


Figure 4 : Location of zero/span adjusters

Example

Assume a sensor is to have a range of 100ppm, and that a span gas of 50ppm concentration is to be used. The span current expected is calculated using the formula

Span Current = $4 + \frac{16 \times GasConcentration}{SensorRange}$ mA

Substituting the concentration and range gives

Span Current = 4 + (16 x 50/100) = 12.0mA

5 Sensor cell replacement

Refer to section 10.1 which specifies the expected operating life of each of the sensor cells. For most cells this is approximately 2 years However, if the cell is constantly exposed to high doses of its specific gas, or gases to which it is cross sensitive (section 11.1), then its life span will be reduced in proportion to the concentration/exposure time. It is a matter for the user to decide whether the cell is replaced automatically at a pre-determined interval, or if it is left until a time when it is no longer possible to calibrate. This will depend on the nature of the application.

To replace the sensor cell it is simply a matter of removing the knurled white plastic retainer and extracting the cell together with its circular contact assembly as shown in Figure 5.

Most sensor cells are supplied with a spring wire shorting link fitted across two of its contacts. **THIS SHORTING LINK MUST BE REMOVED BEFORE THE SENSOR CELL IS FITTED INTO THE HOUSING.**

Fit the new sensor cell in the housing and replace the cell retainer. Allow approximately one hour for the new cell to settle and then carry out the calibration procedure (section 4) appropriate to the system.

The cells used in the 3005 SI, 3008 SI, 3010 SI and 3017 SI sensors (nitric oxide, ammonia, hydrogen chloride and ethylene oxide) operate in a slightly different mode from the others in the range. These four sensors require a longer settling time after the initial application of excitation voltage and it is recommended that a calibration check is carried out about 24 hours after 'power up'. Further very slow movement of the 'zero' level will occur over a period of about 3 weeks after initial power-up. Consequently, checks should be made over this period and a full calibration procedure carried out at the end of this period.

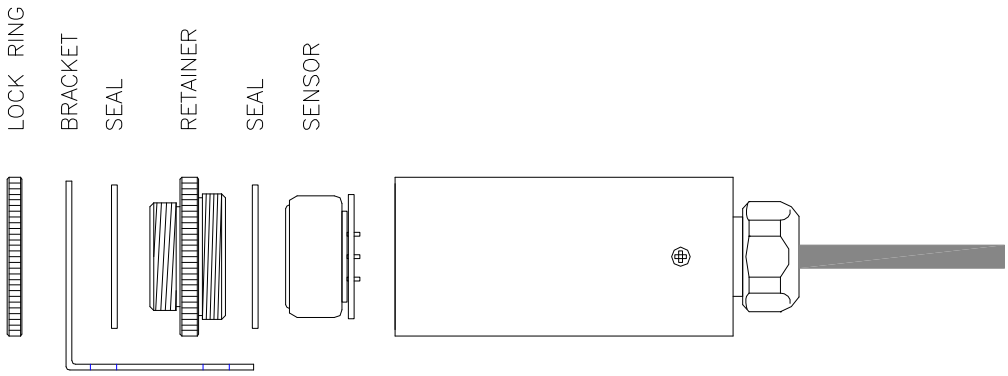


Figure 5 : Replacement of sensor cell

5.1 Disposal of discarded cell

When the life of the sensor has expired or it is leaking or otherwise damaged it must be disposed of safely in accordance with local regulations.

6 Repair

Apart from normal sensor cell replacement and periodic calibration the 3000 SI sensors should not require any other attention. Since the electronic circuits are encapsulated there are no serviceable parts in the unit.

In case of difficulty contact Analox for advice.

7 Warranty information

We provide the following warranties for the Analox 3000:

Electronics warranty : 1 year

Sensor warranty : 1 year (except O2, HCN, NH3, HF : 6 months)

In both cases the warranty period runs from the date of our invoice.

We warrant that the equipment will be free from defects in workmanship and materials.

The warranty does not extend to and we will not be liable for defects caused by the effects of normal wear and tear, erosion, corrosion, fire, explosion, misuse, use in any context or application for which the equipment is not designed or recommended, or unauthorised modification.

Following a valid warranty claim in accordance with the above, the equipment, upon return to us, would be repaired or replaced without cost or charge but in our discretion we may elect instead to provide to you which ever is the lesser of the cost of replacement or a refund of net purchase price paid as per our invoice on initial purchase from us. We shall have no liability for losses, damages, costs or delays whatsoever. We shall have no liability for any incidental or consequential losses or damages. All express or implied warranties as to satisfactory or merchantable quality, fitness for a particular or general purpose or otherwise are excluded and no such warranties are made or provided, save as set out in this Clause 7.

In order to effectively notify a warranty claim, the claim with all relevant information and documentation should be sent in writing to:

Analox Limited
15 Ellerbeck Court
Stokesley Business Park
Stokesley
North Yorkshire
TS9 5PT

or by

e-mail to : info@analox.net

Fax to : +44 1642 713900

We reserve the right to require from you proof of dispatch to us of the notification of warranty claim by any of the above alternative means.

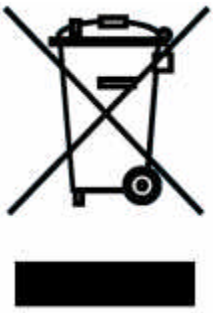
The equipment should not be sent to us without our prior written authority. All shipping and insurance costs of returned equipment are to be born by you and at your risk. All returned items must be properly and sufficiently packed.

8 Spares and accessories

The following accessories are available for the 3000 SI series of sensors.

Part number	Description	Comments
8000-0011GA	Flow adaptor	Required for calibration or for in-line monitoring
SA2-TGSH4	Cell retainer (oxygen cells)	Spare items for parts supplied with sensor
8100-1004	Cell retainer (toxic cells)	
8100-1005	Locking ring	
8100-1006	Mounting bracket	
2321-0514	Inner seal	
2321-0521	Outer seal	
9007-7787	7787+ IS barrier (standard)	Accessories for use in hazardous area applications. Analox will supply the barriers mounted in the selected enclosure.
9007-0787	787S IS barrier (alternative)	
9007-0005A	5 way barrier enclosure	
9007-0013A	13 way barrier enclosure	
9007-0033A	33 way barrier enclosure	
State model and range e.g. 3002 SI, 100ppm	Replacement cells	The cells are consumable items. Refer section 10.1 for expected life.
State requirements	Calibration gas	For checking and/or calibrating sensor

9 Disposal



According to WEEE regulation this electronic product can not be placed in household waste bins. Please check local regulations for information on the disposal of electronic products in your area.

10 Specifications

10.1 General specifications

Range	Refer to Table 1, Page 3
Power supply/output	Loop powered 4-20mA DC Operating voltages/max loop resistance defined in Figure 1
Operating pressure	Atmospheric +/- 10%
Operating temperature	Generally -20 to +40 °C except HF : -20 to +35 °C NH_3 : -20 to +30 °C
Operating life in air at standard temperature and pressure (STP)	O_2 : 1 to 1.5 years HCN, NH_3, HF : 1 year All others 2 to 3 years
Material	316 stainless steel with acetyl insert
IP Rating	IP65
Dimensions (Excluding bracket)	Height 125mm (to top of gland) Diameter 42mm
Weight	< 0.6kg

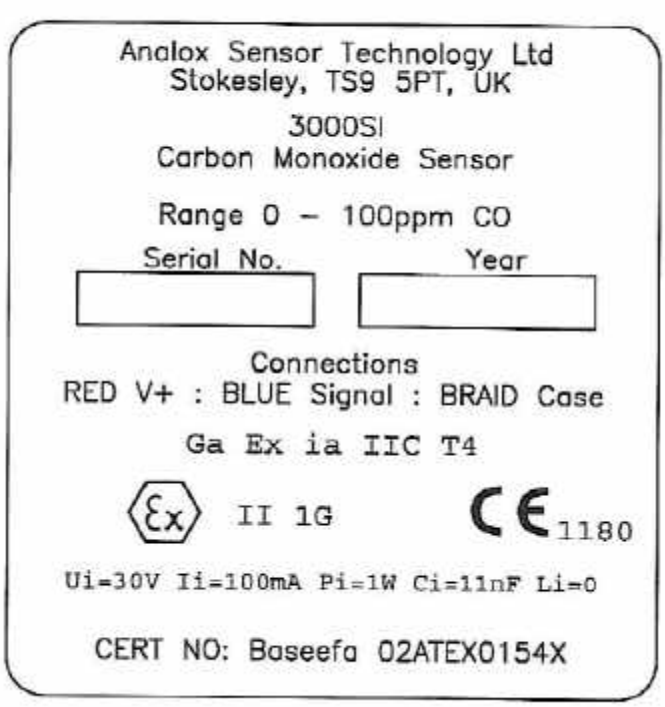
10.2 Safety specifications

Certificate number	Baseefa 02ATEX0154X	
ATEX group/category	⟨Ex⟩ II 1G	
CENELEC marking[1]	before March 2008	EEx ia IIC T4
	after April 2008	Ga Ex ia IIC T4
Ambient temperature	-20°C to +40°C	
Apparatus parameters	U_i : 30V I_i : 100mA P_i : 1W C_i : 11nF L_i : 0uH	
Zener barrier safety Description	Better than or equal to 28V, 300 O, 93mA	

[1] Prior to 31 March 2008, equipment was certified against EN50014:1997+Amnd 1&2, EN50020:2002 and EN50284:1999. These standards are only harmonised until dates between October 2008 and October 2009. The product has now been re-certified against the harmonised standards EN60079-0:2006, EN60079-11:2007 and EN60079-26:2007. No physical changes, other than labelling have been made as a result of this exercise.

10.2.1 Transmitter labelling

The diagram below shows an example of a 3000 SI carbon monoxide sensor ranged at 0 to 100 ppm CO. Other variants of transmitter will differ only in terms of the model number, specific gas and range details. This information is engraved into the stainless steel housing of the transmitter.



11 Response times and sensor drift

Gas		Model	Response time (secs)	Drift
carbon monoxide	CO	3000 SI	T_{90} < 30	<5% signal/year
hydrogen sulphide	H_2S	3001 SI	T_{90} < 30	<2% signal/month
sulphur dioxide	SO_2	3002 SI	T_{90} < 15	<2% signal/month
hydrogen	H_2	3003 SI	T_{90} < 50	<2% signal/month
nitrogen dioxide	NO_2	3004 SI	T_{90} < 40	<2% signal/month
nitric oxide	NO	3005 SI	T_{90} < 15	<2% signal/month
chlorine	Cl_2	3006 SI	T_{80} < 60	<2% signal/month
hydrogen cyanide	HCN	3007 SI	T_{90} < 150	<5% signal/month
ammonia	NH_3	3008 SI	T_{90} < 150	<10% signal/month
ozone	O_3	3009 SI	T_{90} < 150	<4% signal/month
hydrogen chloride	HCl	3010 SI	T_{90} < 120	<2% signal/month
chlorine dioxide	ClO_2	3011 SI	T_{80} < 60	<2% signal/month
oxygen	O_2	3012 SI	T_{90} < 20	<5% signal/year
fluorine	F_2	3013 SI	T_{80} < 60	<2% signal/month
phosphine	PH_3	3014 SI	T_{80} < 60	<2% signal/month
bromine	Br_2	3015 SI	T_{80} < 60	<2% signal/month
hydrogen fluoride	HF	3016 SI	T_{90} < 120	<10% signal/month
ethylene oxide	C_2H_4O	3017 SI	T_{90} < 140	<5% signal/year

11.1 Cross sensitivity to other gases

The sensor cells may exhibit a response to certain gases other than the specific target gas. Several cells have been tested with a number of commonly cross-interfering gases and the typical results are shown in . The test gas concentrations are relevant to safety applications (TLV levels).

Depending on the nature of the reaction each gas has with the sensor, the effect can either decrease the signal (negative cross-sensitivity) or increase the signal (positive cross-sensitivity). For safety concerns, a negative cross-sensitivity may present more problems than a positive one, as this will tend to diminish the response to the target gas and so possibly inhibit alarms. In such cases it may be necessary to monitor both gases.

The table shows the effect in percentage terms of the cross interfering gas. As an example, take a CO sensor measuring 0 to 100ppm CO. 100ppm of H_2 in the gas sample, having an effect of <60%, could therefore indicate up to an apparent 60ppm of CO in the absence of any actual CO.

Also note for instance the effect of H_2S on the HCN sensor. In the presence of any H_2S, it is not possible to measure HCN.

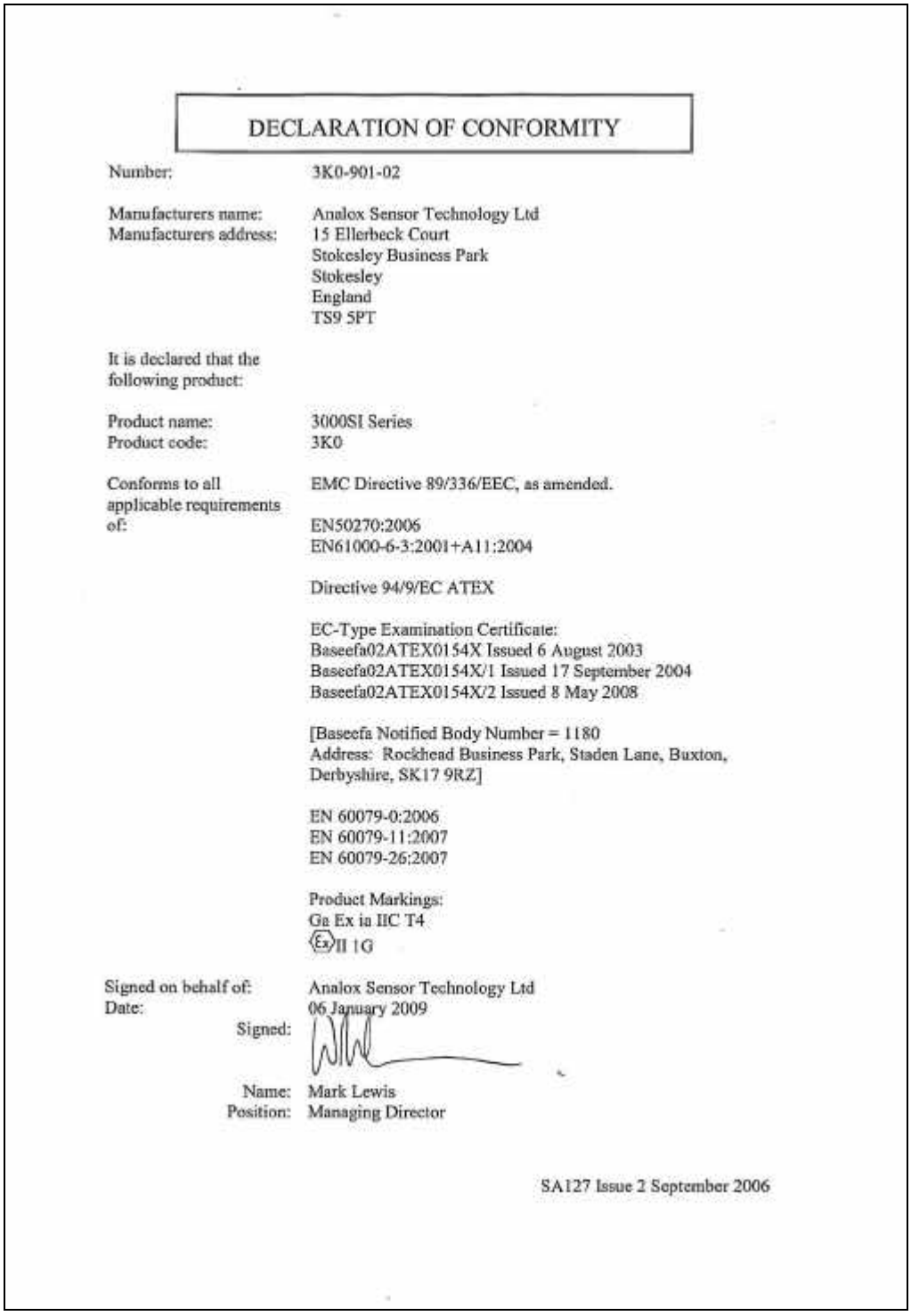
All values given are for guidance only. There may be differences within batches of sensors, and sensors may also behave differently with changes in ambient conditions.

Contact Analox for further details or advice if necessary.

Table 3 : Cross sensitivity data

Test Gas	Sensor Type / %Effect																	
	3000 CO	3001 H_2S	3002 SO_2	3003 H_2	3004 NO_2	3005 NO	3006 Cl_2	3007 HCN	3008 NH_3	3009 O_3	3010 HCl	3011 ClO_2	3012 O_2	3013 F_2	3014 PH_3	3015 Br_2	3016 HF	3017 C_2H_4O
CO	100	<0.5	<1	≈10	0	0	0	<10	0	0	<1	0	<-0.5	0	0	0	0	≈40
H_2S	≈5	100	≈130	<20	≈-10	≈30	≈-25	≈350	≈10	≈-15	≈70	≈-20	-	≈-20	>100	-25	≈-20	0
SO_2	0	<20	100	0	≈-1	0	-1	≈160	≈5	0	≈40	-1	-	-1	≈100	-1	-	0
H_2	<60	<0.05	0	100	0	0	0	0	0	0	<0.5	0	<-2	0	0	0	0	0
NO_2	≈-20	≈-20	≈-120	0	100	<30	≈100	≈-100	0	≈70	<10	≈100	-	≈100	>100	≈100	≈100	0
NO	<20	<6	≈-1	≈30	0	100	0	≈-10	≈2	0	0	0	-	0	0	0	-	0
Cl_2	0	≈-20	≈-50	0	≈100	0	100	≈-50	≈-5	≈100	+/-10	≈100	-	≈100	>100	≈100	≈100	0
HCN	<20	≈-0.5	≈50	≈30	0	0	0	100	≈1	0	<3	0	-	0	0	0	-	0
NH_3	-	-	-	-	-	-	-	-	100	-	-	-	-	-	0	0	-	0
O_3	-	-	-	-	-	-	-	-	-	100	-	-	-	-	-	0	-	0
HCl	0	0	≈20	0	0	<20	0	-	0	0	100	0	-	0	-	0	≈500	0
CH_4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C_2H_4	<100	0	0	≈80	0	0	0	<1	0	0	<3	0	0	-	-	-	-	100
C_2H_5OH	0	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-	0	≈55

12 Declaration of conformity



DECLARATION OF CONFORMITY

Number:	3K0-901-02
Manufacturers name:	Analox Sensor Technology Ltd
Manufacturers address:	15 Ellerbeck Court Stokesley Business Park Stokesley England TS9 5PT
It is declared that the following product:	
Product name:	3000SI Series
Product code:	3K0
Conforms to all applicable requirements of:	EMC Directive 89/336/EEC, as amended. EN50270:2006 EN61000-6-3:2001+A11:2004 Directive 94/9/EC ATEX EC-Type Examination Certificate: Baseefa02ATEX0154X Issued 6 August 2003 Baseefa02ATEX0154X/1 Issued 17 September 2004 Baseefa02ATEX0154X/2 Issued 8 May 2008 [Baseefa Notified Body Number = 1180 Address: Rockhead Business Park, Staden Lane, Buxton, Derbyshire, SK17 9RZ] EN 60079-0:2006 EN 60079-11:2007 EN 60079-26:2007 Product Markings: Ga Ex ia IIC T4 Ex II 1G
Signed on behalf of:	Analox Sensor Technology Ltd
Date:	06 January 2009
Signed:	
Name:	Mark Lewis
Position:	Managing Director

SA127 Issue 2 September 2006

13 Baseefa certification

Certificate Number
Baseefa02ATEX0154X

Baseefa

Issued 6 August 2003
Page 1 of 2

1 **EC - TYPE EXAMINATION CERTIFICATE**

2 **Equipment or Protective System Intended for use in Potentially Explosive Atmospheres Directive 94/9/EC**

3 EC - Type Examination Certificate Number: **Baseefa02ATEX0154X**

4 Equipment or Protective System: **ANALOX TOXIC GAS SENSOR/TRANSMITTER SERIES 3000 SI**

5 Manufacturer: **SCOTTISH ANGLO ENVIRONMENTAL PROTECTION LTD**

6 Address: **Stokesley, North Yorkshire, TS9 5JY**

7 This equipment or protective system and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

8 Baseefa (2001) Ltd. Notified body number 1180, in accordance with Article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment or protective system has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in Annex II to the Directive.

The examination and test results are recorded in confidential Report No. **02(C)0181**

9 Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN 50014: 1997 + amendments 1 & 2 **EN 50020: 2002** **EN 50284: 1999**

except in respect of those requirements listed at item 18 of the Schedule.

10 If the sign "X" is placed after the certificate number, it indicates that the equipment or protective system is subject to special conditions for safe use specified in the schedule to this certificate.

11 This EC - TYPE EXAMINATION CERTIFICATE relates only to the design and construction of the specified equipment or protective system. Further requirements of the Directive apply to the manufacturing process and supply of this equipment or protective system. These are not covered by this certificate.

12 The marking of the equipment or protective system shall include the following :

Ex II 1 G EEx ia IIC T4

This certificate may only be reproduced in its entirety, without any change, schedule included.

Baseefa (2001) Ltd. Customer Reference No. **2680** Project File No. **02/0181**

This certificate is granted subject to the general terms and conditions of Baseefa (2001) Ltd. It does not necessarily indicate that the equipment may be used in particular industries or circumstances.

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R S SINCLAIR
DIRECTOR
On behalf of
Baseefa (2001) Ltd.

Certificate Number
Baseefa02ATEX0154X

Baseefa

Issued 6 August 2003
Page 2 of 2

13 **Schedule**

14 **Certificate Number Baseefa02ATEX0154X**

15 **Description of Equipment or Protective System**

The Analox Toxic Gas Sensor/Transmitter Series 3000 SI is designed to detect the presence of toxic gases, or the level of oxygen for oxygen deficiency monitoring, and provide an electrical output.

It comprises electronic circuits on two printed circuit boards, encapsulated into a plastic cylinder, which is then further enclosed in a steel outer housing. The sensor cell is mounted at one end of the housing, and an integral cable emerges through a threaded entry at the opposite end.

The Series 3000 SI comprises types 3000 SI to 3009 SI, which cover different sensor cells depending on the gas being detected.

Input parameters

$U_i = 30V$, $I_i = 100mA$, $P_i = 1W$, $C_i = 11nF$, $L_i = 0$

16 **Report Number**

02(C)0181

17 **Special Conditions for Safe Use**

1. Connections are made by means of a two core screened cable. The internal circuit is connected to the two cores and isolated from the metal case, but the screen is connected to the metal case. This must be taken into account on any installation in which the apparatus is used.

2. This apparatus is not designed for use in oxygen enriched atmospheres.

18 **Essential Health and Safety Requirements**

All relevant Essential Health and Safety Requirements are covered by the standards listed at item 9.

19 **Drawings and Documents**

Number	Issue	Date	Description
3K0-100-03	03	01.8.03	3000 Series GA Drawing : Toxic Version
3K0-101-03	03	01.8.03	3000 Series GA Drawing : Oxygen Version
3K0-200-03	03	25-07-03	Toxic Sensor Transmitter 4-20mA (Circuit Diagram)
3K0-201 Sheets 1 to 5	02A	25-07-03	PCB Drawings, Toxic Sensor/Transmitter 3000SI
3K0-202 Sheets 1 to 3	11	24/07/03	Parts List, Toxic Sensor/Transmitter 3000SI Series
3K0-412-02	2	9.6.03	Analox Gas Sensor 3000SI Series - Gas Range (Cell Details)
3K0-420-01	01	25.7.03	3000 Series Internal Construction Detail (Toxic Version)
3K0-421-01	01	25.7.03	3000 Series Internal Construction Detail Oxygen Version
3K0-410-05	5	10.12.02	Labelling Details

Certificate Number
Baseefa02ATEX0154X/1

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Issued 17 September 2004
Page 1 of 2

1 **SUPPLEMENTARY EC - TYPE EXAMINATION CERTIFICATE**

2 **Equipment or Protective System Intended for use in Potentially Explosive Atmospheres Directive 94/9/EC**

3	Supplementary EC - Type Examination Certificate Number:	**Baseefa02ATEX0154X/1**
4	Equipment or Protective System:	**Analox Toxic Gas Sensor/Transmitter Series 3000 SI**
5	Manufacturer:	**Analox Ltd (Formerly Scottish Anglo Environmental Protection Ltd)**
6	Address:	**Stokesley, North Yorkshire, TS9 5JY**

7 This supplementary certificate extends EC – Type Examination Certificate No. Baseefa02ATEX0154X to apply to equipment or protective systems designed and constructed in accordance with the specification set out in the Schedule of the said certificate but having any variations specified in the Schedule attached to this certificate and the documents therein referred to.

This supplementary certificate shall be held with the original certificate.

This certificate may only be reproduced in its entirety, without any change, schedule included.

Baseefa (2001) Ltd. Customer Reference No. **2680**

Project File No. **04/0701**

This certificate is granted subject to the general terms and conditions of Baseefa (2001) Ltd. It does not necessarily indicate that the equipment may be used in particular industries or circumstances.

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R S SINCLAIR
DIRECTOR
On behalf of
Baseefa (2001) Ltd.

13 **Schedule**

14 **Certificate Number Baseefa02ATEX0154X/1**

15 Description of the variation to the Equipment or Protective System

Variation 1.1

To confirm that the range of sensor types covered by this Certificate is 3000 SI to 3017 SI, and to permit a minor change to the drawing listed below.

16 Report Number

None

17 Special Conditions for Safe Use

None additional to those listed previously

18 Essential Health and Safety Requirements

Compliance with the Essential Health and Safety Requirements is not affected by this variation.

19 Drawings and Documents

Number	Issue	Date	Description
3K0-412-03	3	17.9.04	Analox Gas Sensor 3000SI Series - Gas Range (Cell Details)

Certificate Number
Baseefa02ATEX0154X/2

Issued 8 May 2008
Page 1 of 2

1 **SUPPLEMENTARY EC - TYPE EXAMINATION CERTIFICATE**

2 **Equipment or Protective System Intended for use in Potentially Explosive Atmospheres Directive 94/9/EC**

3	Supplementary EC - Type Examination Certificate Number:	**Baseefa02ATEX0154X/2**
4	Equipment or Protective System:	**Analox Toxic Gas Sensor/Transmitter Series 3000 SI**
5	Manufacturer:	**Analox Ltd**
6	Address:	**Stokesley, North Yorkshire, TS9 5PT**

7 This supplementary certificate extends EC – Type Examination Certificate No. Baseefa02ATEX0154X to apply to equipment or protective systems designed and constructed in accordance with the specification set out in the Schedule of the said certificate but having any variations specified in the Schedule attached to this certificate and the documents therein referred to.

This supplementary certificate shall be held with the original certificate.

This certificate may only be reproduced in its entirety, without any change, schedule included.

Baseefa Customer Reference No. **2680** Project File No. **08/0298**

This certificate is granted subject to the general terms and conditions of Baseefa. It does not necessarily indicate that the equipment may be used in particular industries or circumstances.

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Baseefa is a trading name of Baseefa Ltd
Registered in England No. 4305578. Registered address as above.

D BREARLEY
pp R S SINCLAIR
DIRECTOR
On behalf of
Baseefa

13 **Schedule**

14 **Certificate Number Baseefa02ATEX0154X/2**

15 **Description of the variation to the Equipment or Protective System**

Variation 2.1

To permit minor changes to components, which do not impair the safety assessment.

Variation 2.2

To confirm that the apparatus complies with the requirements of EN60079-0:2006, EN60079-11:2007 and EN60079-26:2007 and may therefore be marked

Ga Ex ia IIC T4

Ⓔx II 1G

16 **Report Number**

None

17 **Special Conditions for Safe Use**

None additional to those listed previously

18 **Essential Health and Safety Requirements**

Compliance with the Essential Health and Safety Requirements is not affected by this variation.

19 **Drawings and Documents**

Number	Issue	Date	Description
3K0-202 Sheets 1 to 3	15C	29-APR-2008	PCB Parts List (Certification)
3K0-410-07	7	28.04.08	Analox Toxic Gas Sensor 3000SI Series, Case Marking Detail